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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Lawn sprinklers for lawns etc.**

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Description

This invention relates to water sprinklers, for lawns, tennis courts etc of the kind which includes a mechanism whereby the area covered by the sprinkler is continuously changed during use.

In French patent specification No. 10401 (Johnson) there is disclosed a water sprinkler for use in fire extinguishing and the like, in which an inclined hollow distribution shaft is driven about a vertical axis by a pinion gear rotated by a water paddle. The pinion gear also drives a bevel gear in which the distribution shaft is mounted. Due to a difference in the number of teeth of the two gears driven by the pinion gear, a slow rotation is produced of the distribution shaft about its own axis while it is also being rotated about the vertical axis. Such a water sprinkler can thus only produce a generally circular or spiral pattern of water distribution, and moreover requires a complicated and therefore expensive gear train.

According to this invention a water sprinkler comprises a body, a rotor which is rotatably mounted within the body to be driven by incoming water, a hollow distribution shaft mounted to rotate with respect to the body about a vertical axis and having its own axis inclined thereto, and drive means which transmit drive from the rotor to the hollow distribution shaft to rotate the latter about the vertical axis as water issues from an upper end of the shaft, the drive means also rotating the distribution shaft about its own inlcined axis simultaneously with the rotation of the distribution shaft about the vertical axis, characterised in that the drive means comprise an epicyclic gear mechanism including a pinion mounted to rotate with the rotor, a planet gear rotatable with the distribution shaft and an outer ring gear on the internal wall of the body, the planet gear meshing both with the pinion and the outer ring gear.

The direction and strength of the water issuing from the upper end of the distribution shaft may be determined by the shape, dimensions and/or number of bores, of a selected spray nozzle, which may be detachably fitted to the distribution shaft.

In order that the invention may be readily understood, and further features made apparent, one embodiment of water sprinkler will now be described, with reference to the accompanying drawings in which:-

Figure 1 is an exploded, perspective view of the components of the sprinkler,

Figure 2 is a cross-sectional elevation of the assembled sprinkler,

Figure 3 is a section on the line III—III of Figure 1, and

Figure 4 is a diagrammatic representation of a spray pattern followed by the sprinkler, in use.

Referring to the drawings, the sprinkler generally comprises a circular, cylindrical body 15 (see Figure 2) which houses a vaned rotor (or impeller) 1. The uppermost end of a hub of the rotor 1 fixedly carries a bevelled pinion 2. The rotor 1 is free to rotate about a central vertical axis A—A on an axle 3 which depends from a carrier 4. A hollow distribution shaft 5, which is threaded at its uppermost end 6, is carried by the carrier 4 and has at its lower end a bevelled planet gear 7 arranged to mesh with the pinion 2. The shaft 5 is free to rotate in the carrier 4 about an axis inclined at 45° to the vertical axis A—A. The carrier 4 is free to rotate about the vertical axis A—A between (at its lower end) the axle 3 and (at its top face) a bearing boss 17.

A drive mechanism for the sprinkler is in the form of an epicyclic bevel gear and consists of the bevelled pinion 2, the bevelled planet gear 7 and an outer ring gear 11 centred on the axis A—A. The ring gear 11 has internally projecting bevelled teeth which are formed as an integral part of the body 15 by a base closure plate 8. The top of the body has a bearing aperture 9, which allows free rotation of the boss 17 of the carrier 4, and the base closure plate 8 has a blind bearing 10 which allows free rotation of the lower end of the axle 3. The shaft 5 has a central flow passage which, at the lower end of the shaft 5, communicates with the interior of the body 15 through a central aperture in the bevel gear 7. The shaft 5 extends across the vertical axis A—A.

The body 15 also has a water inlet at 12 which is positioned tangentially to the rotor 1 (see Figure 3).

When assembled, a nozzle 13 is fitted to the threaded end 6 of the distribution shaft 5 and, as will be apparent from Figure 2, this nozzle has an outlet jet 14 positioned at an angle of 22.5° from the central longitudinal axis of the shaft 5.

In operation of the sprinkler, water enters via inlet 12 and emits via outlet jet 14. The inflow of water causes the vaned rotor 1 to rotate, which causes distribution shaft 5 to rotate about its own, inclined, axis. The outlet jet sprays a conical pattern between the vertical and 67.5°, whilst at the same time the engagement between the planet gear 7 and the outer ring gear 11 causes the carrier 4 to rotate about the vertical axis A—A, thereby moving the distribution shaft 5 bodily around said vertical axis. Thus, the spray pattern generated by both these movements will be generally as shown in Figure 4, or a modified form of that pattern, depending upon the variables used.

A typical epicyclic gear train could be:—

(a) No. of teeth in pinion 2 = 10
(b) No. of teeth in planet 7 = 50
(c) No. of teeth in outer ring gear 11 = 101

This would create the pattern shown in Figure 4 and provides a regular, set, angular displacement of the nozzle 13 (and hence between the peaks "a" of the pattern) of 1/100th of a revolution, or 3.6°.

It should be noted that (c) should not be a multiple of (b). Ideally (c) should be a prime number. Were (c) to be a multiple of (b), a simple

repeat pattern would occur, and uneven sprinkling would result.

It will be appreciated that for maximum distance thrown by the water jet, and hence maximum area coverage a single nozzle may be used, but for smaller areas and finer spray, a multiple jet nozzle may be used.

All components of the sprinkler may be moulded from a synthetic plastics material.

Claims

1. A water sprinkler comprising a body, a rotor which is rotatably mounted within the body to be driven by incoming water, a hollow distribution shaft mounted to rotate with respect to the body about a vertical axis and having its own axis inclined thereto, and drive means which transmit drive from the rotor to the hollow distribution shaft to rotate the latter about the vertical axis as water issues from an upper end of the shaft, the drive means also rotating the distribution shaft about its own inclined axis simultaneously with the rotation of the distribution shaft about the vertical axis, characterised in that the drive means comprise an epicyclic gear mechanism including a pinion (2) mounted to rotate with the rotor (1), a planet gear (7) rotatable with the distribution shaft (5) and an outer ring gear (11) on the internal wall of the body (15), the planet gear meshing both with the pinion and the outer ring gear.

2. A sprinkler according to claim 1, characterised in that the rotor (1) is rotatably mounted about the vertical axis and the ring gear (11) is centred on the vertical axis.

3. A sprinkler according to claim 1 or claim 2, characterised in that the pinion (2), planet gear (7) and outer ring gear (11) are bevelled.

4. A sprinkler according to any of claims 1 to 3, characterised in that the number of teeth on the outer ring gear (11) is greater than the number of teeth on the planet gear (7) but is not a multiple thereof.

5. A sprinkler according to any of claims 1 to 4, characterised by a carrier (4) which is rotatably mounted about the vertical axis and which rotatably supports the distribution shaft (5) for rotation of the latter about its inclined axis.

6. A sprinkler according to claim 5, characterised in that the body (15) has an upper aperture (9) through which the distribution shaft (5) extends, the aperture forming a rotational bearing for the upper end of the carrier (4).

7. A sprinkler according to claim 6, characterised in that the carrier (4) is rotatably mounted on an axle (3) projecting upwardly from the pinion (2).

8. A sprinkler according to any of claims 5 to 7, characterised in that the distribution shaft (5) crosses said vertical axis.

Patentansprüche

1. Ein Wassersprenger mit einem Körper, einem in diesem zum Antrieb durch ankommendes Wasser drehbar angeordneten Rotor, einer gegenüber dem Körper um eine Vertikalachse drehbar angeordneten hohlen Verteilerwelle mit einer gegenüber der Vertikalachse geneigten eigenen Achse und mit Antriebsmitein, die den Antrieb vom Rotor auf die hohle Verteilerwelle zu deren Drehung un die Vertikalachse während des Austritts von Wasser aus dem oberen Ende der Welle übertragen, wobei die Antriebsmittel die Verteilerwelle gleichzeitig mit deren Drehung um die Vertikalachse um ihre eigene geneigte Achse drehen, dadurch gekennzeichnet, daß die Antriebsmittel aus einem Planetenradmechanismus mit einem mit dem Rotor (1) drehbar gelagerten Ritzel (2), einem mit der Verteilerwelle (5) drehbaren Planetenrad (7) und einem Außenzahnkranz (11) auf der Innenwand des Körpers (15) bestehen, wobei das Planetenrad sowohl mit dem Ritzel als auch mit dem Außenzahnkranz kämmt.

2. Ein Sprenger nach Anspruch 1, dadurch gekennzeichnet, daß der Rotor (1) um die Vertikalachse drehbar gelagert ist und der Zahnkranz (11) auf der Vertikalachse zentriert ist.

3. Ein Sprenger nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das Ritzel (2), das Planetenrad (7) und der Außenzahnkranz (11) abgeschrägt sind.

4. Ein Sprenger nach irgendeinem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die Zahl der Zähne auf dem Außenzahnkranz (11) größer als die Zahl der Zähne auf dem Planetenrad (7), aber kein Vielfaches von dieser Zahl ist.

5. Ein Sprenger nach irgendeinem der Ansprüche 1 bis 4, gekennzeichnet durch einen Träger (4), der um die Vertikalachse drehbar gelagert ist und die Verteilerwelle (5) zwecks deren Drehung um deren geneigte Achse drehbar abstützt.

6. Ein Sprenger nach Anspruch 5, dadurch gekennzeichnet, daß der Körper (15) eine obere Öffnung (9) aufweist, durch welche die Verteilerwelle (5) durchtritt, und die Öffnung ein Drehlager für das obere Ende des Trägers (4) bildet.

7. Ein Sprenger nach Anspruch 5, dadurch gekennzeichnet, daß der Träger (4) drehbar auf einer vom Ritzel (2) nach oben vorstehenden Achse (3) drehbar gelagert ist.

8. Ein Sprenger nach irgendeinem der Ansprüche 5 bis 7, dadurch gekennzeichnet, daß die Verteilerwelle (5) die Vertikalachse kreuzt.

Revendications

1. Arroseur à eau comprenant un corps, un rotor qui est monté de façon rotative dans le corps afin d'être entraîné par l'eau entrant dans le dispositif, une tige de distribution creuse, montée de façon à tourner par rapport au corps sur un axe vertical et dont l'axe propre est incliné par rapport à ce dernier, et des moyens d'entraînement qui transmettent l'entraînement du rotor à la tige creuse de distribution de façon à faire tourner cette dernière sur l'axe vertical alors que l'eau sort par une extrémité supérieure de la tige, les moyens d'entraînement faisant également tour-

ner la tige de distribtuion sur son propre axe incliné simultanément avec la rotation de la tige de distribution sur l'axe vertical, caractérisé en ce que les moyens d'entraînement comprennent un mécanisme d'engrenages épicycloïdal comportant un pignon (2) monté de façon à tourner avec le rotor (1), une roue dentée satellite (7) tournant avec la tige de distribution (5) et une couronne dentée externe (11) située sur la paroi intérieure du corps (15), la roue dentée satellite engrenant à la fois avec le pignon et avec la couronne dentée externe.

2. Arroseur selon la revendication 1, caractérisé en ce que le rotor (1) est monté de façon à pouvoir tourner sur l'axe vertical et que la couronne dentée (11) est centrée sur l'axe vertical.

3. Arroseur selon la revendication 1 ou la revendication 2 caractérisé en ce que le pignon (2), la roue dentée satellite (7) et la couronne dentée externe (11) sont coniques.

4. Arroseur selon l'une quelconque des revendications 1 à 3, caractérisé en ce que le nombre de dents de la couronne dentée externe (11) est plus grand que le nombre de dents de la roue dentée satellite (7) mais n'est pas un multiple de celui-ci.

5. Arroseur selon l'une quelconque des revendications 1 à 4, caractérisé par un support (4) qui est monté de façon à pouvoir tourner sur l'axe vertical et que porte de façon rotative la tige de distribution (5) de façon à ce que cette dernièr tourne sur son propre axe incliné.

6. Arroseur selon la revendication 5, caractérisé en ce que le corps (15) comporte une ouverture supérieure (9) à travers laquelle passe la tige de distribution (5) l'ouverture formant un palier de rotation pour l'extrémité supérieure du support (4).

7. Arroseur selon la revendication 6, caractérisé en ce que le support (4) est monté de façon rotative sur un axe (3) qui fait saillie vers le haut à partir du pignon (2).

8. Arroseur selon l'une quelconque des revendications 5 à 7, caractérisé en ce que la tige de distribution (5) traverse ledit axe vertical.

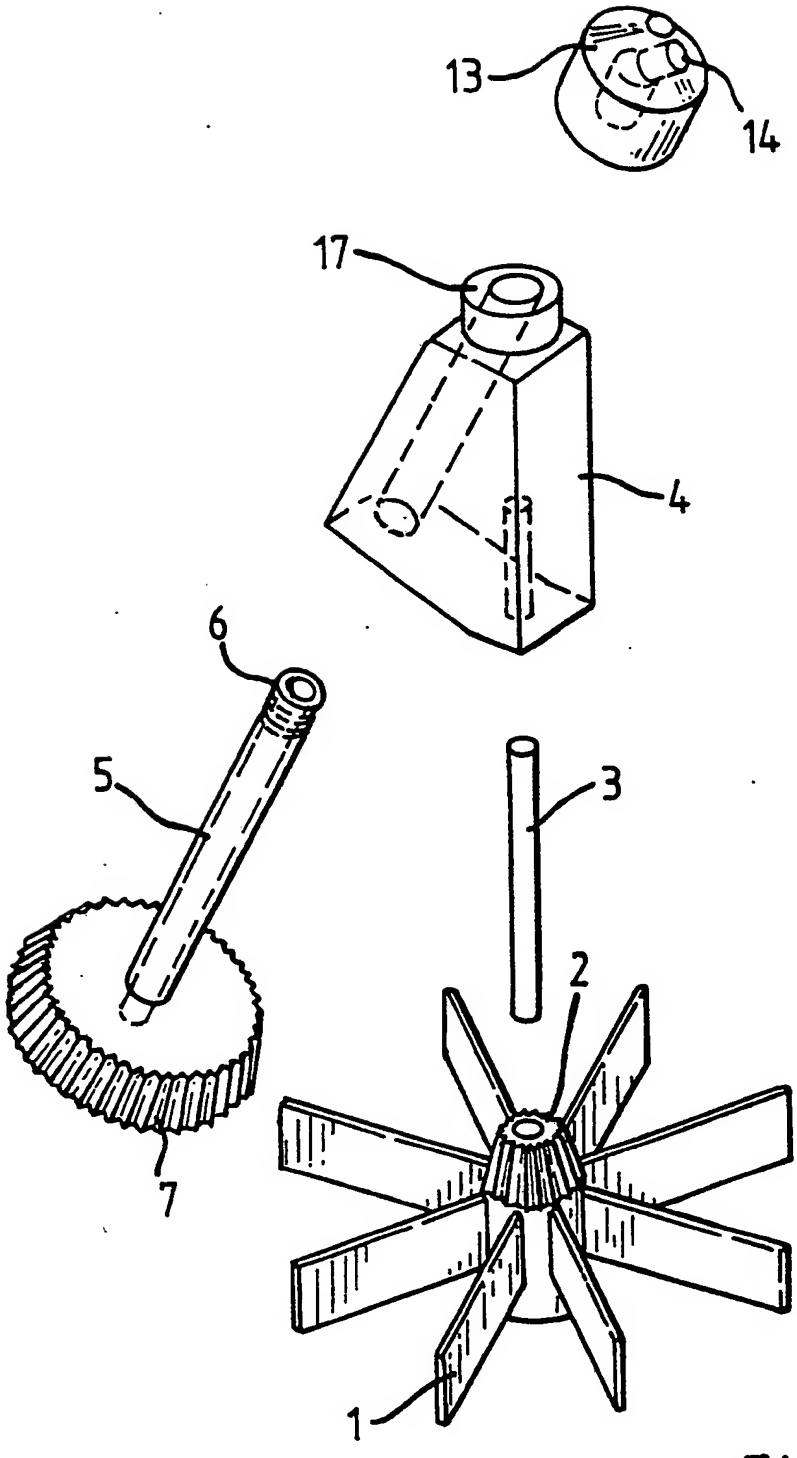

Fig.1

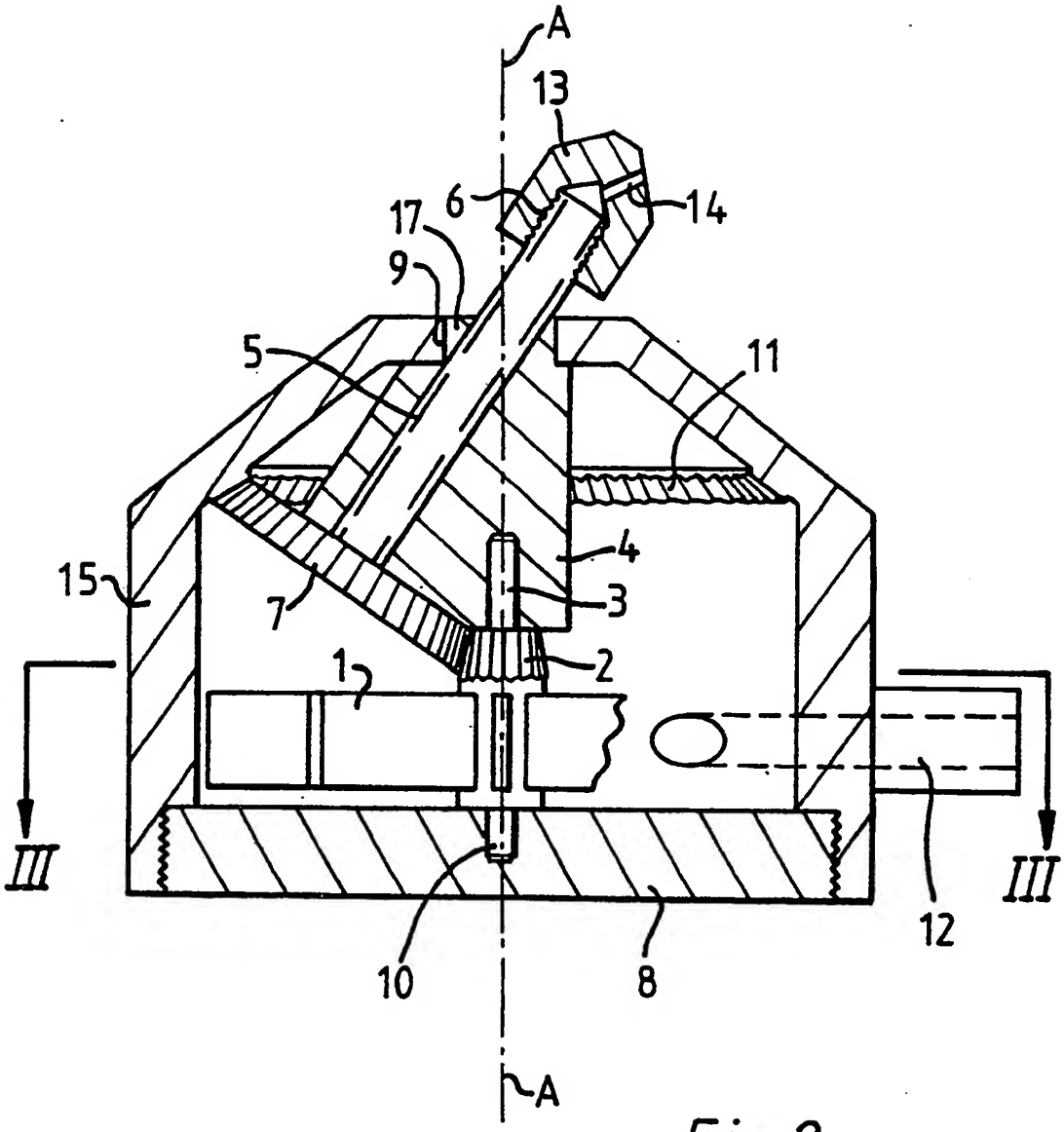

Fig.2

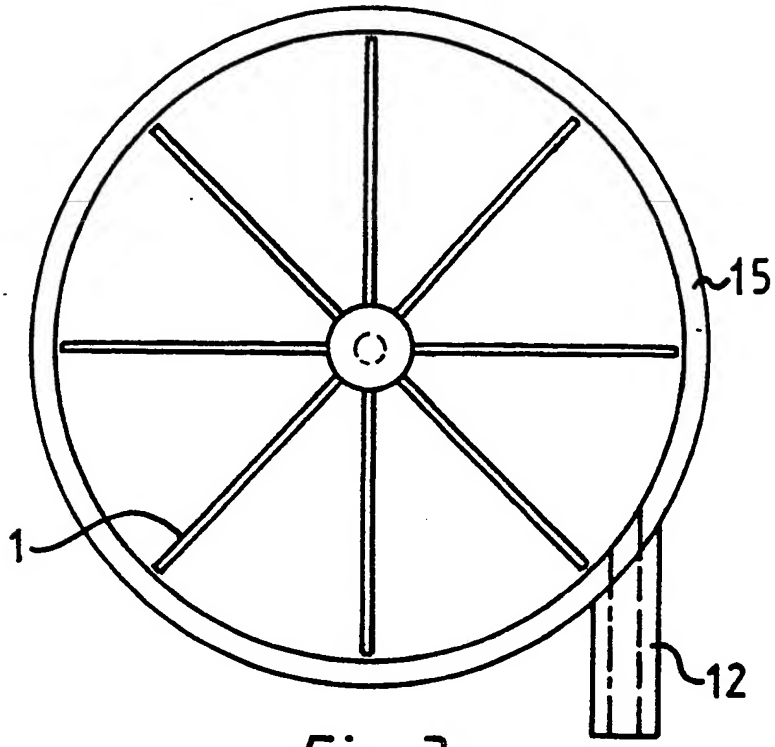

Fig.3

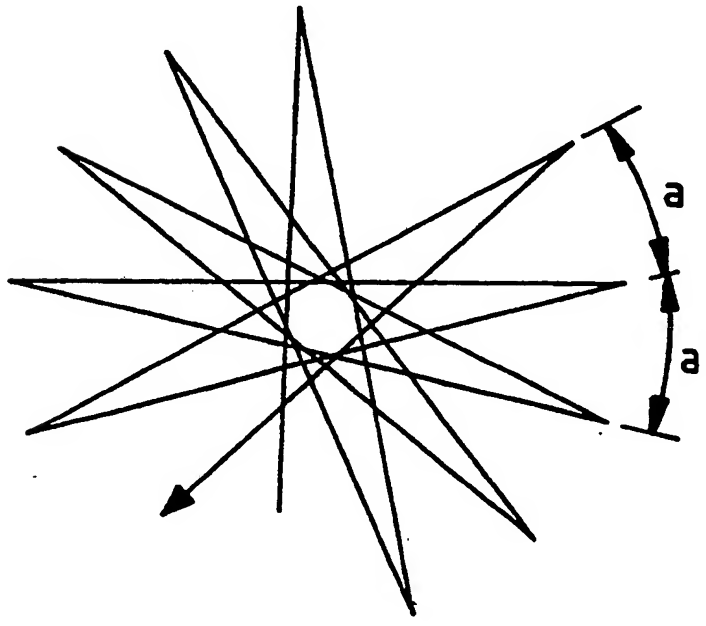

Fig.4